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Agriculture for Sustainable Development: A SWOT-AHP Assessment of Ghana's Planting for Food and Jobs Initiative

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Abstract: The exponential increase in the population of Ghana and the need to meet the population's food security needs while creating job opportunities have necessitated the implementation of the Planting for Food and Jobs (PFJ) initiative by the Government of Ghana (GoG). Using the strengths, weaknesses, opportunities, and threats (SWOT) analytical tool, we SWOT of the PFJ initiative. We further complemented the study with the analytic hierarchy process (AHP) tool to rank the various criteria (factors) identified under the SWOT analysis. The study identified favorable environmental conditions as the highest strength, which recorded 59.3%, followed by agricultural lands availability (21.8%). Inadequate of financial services was identified as the highest weakness (55.8%), followed by over-reliance on climatic conditions (25.9%). High export potential relative to agricultural products in the country was identified as the highest opportunity, which recorded a weight of 50.3%. The One District One Factory (1D1F) initiative came up as the second highest opportunity. Negative ramification of climate change was identified as the main threat to Ghana's agricultural sector (57.9%), followed by the importation of basic food products (25%).

Keywords: SWOT-AHP analysis; Ghana; agricultural sector; planting for food and jobs; sustainable development

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1. Introduction

Agriculture is the single most important sector of the African economy. It plays a significant role in poverty reduction [1], thus helping in attaining the first and second pillars of the United Nations Sustainable Development Goals (SDGs). Despite reducing poverty and malnutrition by half by the end of 2015 under the Millennium Development Goals (MDGs) [2], a considerable number of the Ghanaian population still live below the poverty line of USD 1.25 per day [3]. This is primarily attributed to low agricultural productivity since the Ghanaian agricultural sector is predominantly smallholder. With the country's population currently hovering around 30 million, increasing agricultural productivity and creating employment along the agricultural value chain have become a necessity [4]. Ghana Statistical Service (GSS) [5] projections indicate that the current population will increase by 2-fold by 2050. This implies more pressure on agricultural lands due to the potential increase in demand for such lands for residential purposes. Therefore, it is imperative to adopt efficient measures that will help increase productivity per unit area of land to meet the food and nutrition security needs of the growing population.

Over the last two centuries, Ghana, like other parts of Africa, has struggled to meet its food and nutrition security needs. Notwithstanding, successive governments have pursued various national agendas to arrest the situation [6]. This is made evident by the ratification of global and regional development initiatives such as the MDGs, the SDGs,

and the Comprehensive African Agriculture Development Programme (CAADP) of the New Partnership for Africa's Development (NEPAD) [6]. These programmes have been complemented with local- or national-level efforts such as Ghana's agricultural sector policies and programs, such as the Food and Agriculture Sector Development Policy (FASDEP I and II) and the Medium-Term Agricultural Sector Investment Plan (METASIP I and II), as well as the more recent Planting for Food and Jobs (PFJ) program and the One Village One Dam initiative [6,7].

Smallholder farmers in Ghana are vital to the country's agricultural transformation, with agribusinesses stimulating job creation and economic development [8]. Sustaining and scaling up the sector require investments in managerial, policy, and financing commitments from both the public and private sector.

In effect, Ghana's flagship program, PFJ, was introduced in 2017 to address low agricultural productivity and unemployment. The policy focuses on creating food security and the production of raw materials to feed the agro-processing industries while creating jobs in the process. The PFJ program is predicated on five pillars, namely: (1) provision of improved seeds, (2) fertilizers subsidy, (3) provision of free extension services, (4) agricultural produce marketing, and (5) E-agriculture activities [4]. The program aims to improve productivity levels of cereals, vegetables, and livestock (under "Rearing for Food and Jobs (RFJ)" which commenced in 2019). Lambongagng et al. [7] reported that the PFJ program is expected to improve the country's food security status through 30%, 49%, 25%, and 28% increases in the yields of maize, rice, soybean, and sorghum, respectively. This will be achieved by providing a 50% government subsidy on improved seeds, fertilizers, and extension services to smallholder farmers across the country to create an equal opportunity for farmers to assess farm inputs.

However, the effective implementation of such a program thrives on partnerships involving the government, the private sector, and development institutions. Increasing on-farm productivity and creating off-farm opportunities improves the farming profile as a viable enterprise that will benefit from investments in improved seeds, machinery, technology, knowledge, training, etc.

Since its implementation, several studies have assessed the performance of the PFJ program on crop yield and farmer participation [3,7,8]. However, no study has yet been conducted to evaluate the external and internal factors that influence the program's implementation as well as prescribe measures to improve and enhance its performance. Knowing these factors (internal and external) is critical for policy advice and implementation. Therefore, the current study seeks to evaluate the strengths, weaknesses, opportunities, and threats for the implementation of the PFJ program. The paper's contribution to the said objective is expected to play a key role not just in the PFJ but also in the country's entire agricultural sector. Findings from this paper are expected to serve as a reference material for policy- and decision-makers, investors, and stakeholders in the sector during planning.

2. An Overview of Ghana's Agricultural Sector

The majority of Ghana's farm holdings are less than 2 hectares in size, although some large-scale farms exist. The agricultural land area covers approximately 136,000 km^2, representing about 57% of the country's total land area [9], out of which only 58,000 km^2, representing about 24%, is under cultivation and 11,000 hectares under irrigation [10]. Differences in agro-ecological zones account for variations in the country's farming systems. However, some similar characteristics are visible throughout the country. Cropping systems and types of crops cultivated vary from one ecological zone to another due to the varied nature of the country's climatic conditions. Figure 1 shows the different ecological zones in Ghana.

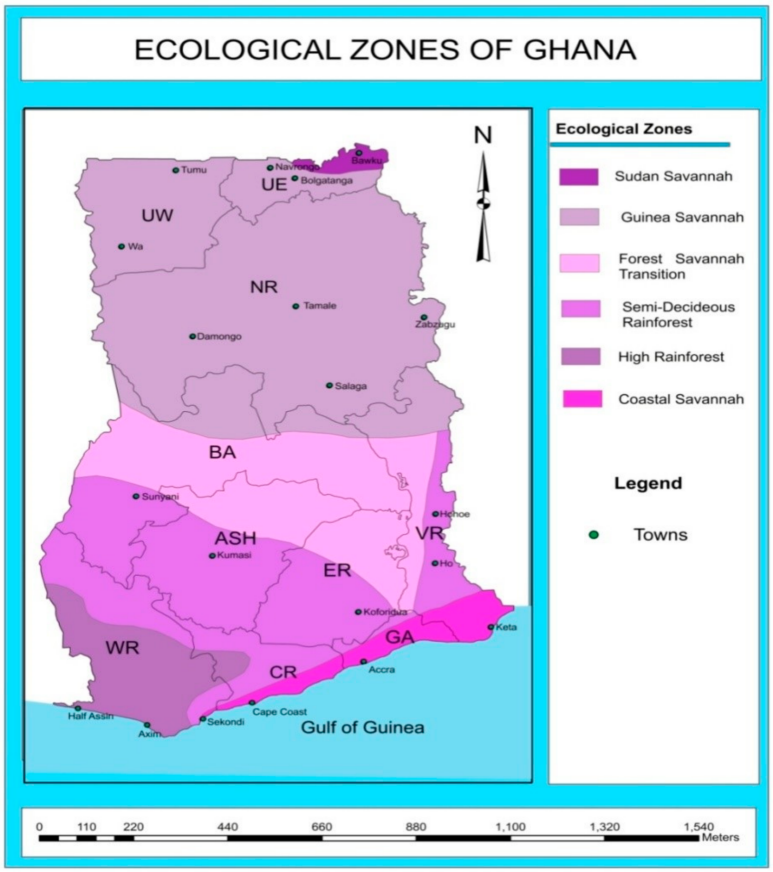

Figure 1. Ghana's ecological zones [11]. Note: UE_Upper East region; UW_Upper West region; NR_Northern region; BA_ Brong Ahafo region; ASH_Ashanti region; ER_Eastern region; VR_Volta region; GA_Greater Accra region; Central region; WR_Western region

Agriculture in Ghana is predominantly agrarian, engaging almost half of the Ghanaian population [2,3,8]. The sector is a major livelihood source for about 44.7% of the country's active labor force [3,10] and engages about 83% of rural households. In rural Ghana, 93%, 81.3%, and 64.7% of households in rural savannah, rural forest, and coastal areas, respectively, are engaged in the sector [12]. Although agriculture's share of gross domestic product (GDP) has declined in recent years, the sector remains relevant to the national economy. For instance, the sectors contribution to GDP declined from 29.8% in 2010 to 17% in 2018 [13–15]. The sector contributes about 75% of the country's overall foreign exchange revenue [12,16,17]. This implies that Ghana's economic development is highly dependent on the agricultural sector. However, it is important to note that a considerable portion of the contribution to the foreign exchange earnings comes from the cocoa sub-sector. Despite recording a considerable increase in recent times, non-traditional agricultural exports contribute about 10% of foreign agricultural revenue [16].

Despite the sector's contribution to the overall economic development of Ghana, it is plagued with numerous challenges. The main challenge faced by the sector is low yields of staple and cash crops. The World Development Indicators (WDI) [18] reported that whereas the expected yield for cereals is over 5.0 t/ha, estimated regional yield is at 2.0 t/ha. Other challenges include the negative effect of climate change and variability, low soil fertility, the incidence of pests and diseases, inadequate extension services and financial support, low use of improved agricultural technologies, unpredictable climatic conditions, and unsustainable agricultural production practices, while the increasing population growth rate has exacerbated the situation [19–21]. As a result of these challenges, Ghana has become a net importer of basic foods such as rice and poultry, thereby exceeding the estimated annual earnings of USD 2 billion from cocoa exports [22]. The country's import

bill is expected to increase exponentially in the next 20 years if local production is not increased [22].

Dealing with the numerous challenges faced by the agricultural sector has been of utmost importance to all stakeholders. This has led to the implementation of several agricultural sector policies and programs by successive governments to deal with the problem. Ghana's agricultural sector policies have evolved over the years through adjustments and reforms to meet expected goals and needs. To transform the Ghanaian economy into a developed nation by 2029, "Ghana Vision 2020" was launched in 1995 with a particular focus on agricultural transformation [6]. Since then, a number of policy interventions have been implemented to achieve this goal. Appiah-Twumasi [6] outlined the following:

1. Food and Agricultural Sector Development Policy (FASDEP I, 2002): this policy was developed to provide a framework to aid in the transformation of the agricultural sector into a modern one.
2. Food and Agricultural Sector Development Policy (FASDEP II, 2007): This was formulated to place emphasis on the sustainable utilization of agricultural resources and commercialization of agricultural activities with a critical focus on poor, risk-prone, and risk-averse producers. This was based on lessons learnt from the failure of FASDEP I.
3. Ghana Shared Growth and Development Agenda (GSGDA 2010–2013): the focus was on supporting the oil and gas industry with investments in agricultural modernization.
4. The Medium-Term Agriculture Sector Plan (METASIP 2010–2015): The METASIP is an investment plan meant for the implementation of the FASDEP II. The plan consists of six programs geared towards the attainment of food security and increased growth in incomes.

To aid the effective implementation of the above, a number of programs and strategies were enrolled. These include:

1. The Agriculture Mechanisation Services Enterprise Centres (AMSECs) program in 2007 was meant to lend credit facilities in the form of assisting qualified private sector companies in purchasing agricultural machinery at a subsidized price and interest rate which, in turn, is rented to rural farmers at affordable prices.
2. Fertilizer Subsidy Programme: this program was launched in 2008 to temporarily relieve farmers of the burden of the high cost of fertilizer.
3. The Block Farm Programme was launched in 2009 to provide support to large blocks of arable land for the production of selected commodities.
4. Planting for Food and Jobs (PFJ): this module was officially launched in 2017 and is ongoing.

3. Review of Empirical Studies

Several experts have employed the multi-criteria decision-making (MCDM) methodology to arrive at conclusive decisions in their field of work. A review of such studies is presented in this segment to show how such decisions were approached.

Suganthi [23] employed a combination of the analytic hierarchy process (AHP), VIsekriterijumsko KOmpromisno Rangiranje (VIKOR), and data envelopment analysis (DEA) to evaluate investments aimed at sustainable development. The fuzzy AHP methodology was used to determine the weights of the various criteria analyzed in the study. The study identified basic amenities as the most crucial factor, which recorded a weight of 0.21, followed by environmental concern (0.18). The various sectors' ranking was also performed using fuzzy VIKOR which identified science and technology as the first, followed by rural development. Baffoe [24] used the AHP methodology to prioritize livelihood activities during poverty reduction interventions in developing economies. De Marinis and Sali [25] used a modified AHP called the participatory analytic hierarchy process (PAHP) and proposed it as a tool in decision making relative to resource allocation and criteria elicitation during operational planning for agricultural development. Their study concluded that the PAHP is suitable for the identification of shared resource allocation

patterns. Szulecka, and Zalaza [26] examined the reasons behind the lack of investments in Paraguay's forest plantations despite the visible wood shortages. The study was conducted using a combination of strengths, weaknesses, opportunities, and threats (SWOT)-AHP analysis with expert views to arrive at some conclusions. The study identified the SWOT for both small- and large-scale plantations and showed that the small-scale plantations have the most strengths. The large-scale plantations were identified to have the most threats.

Furthermore, [27] employed the SWOT analytic network process (ANP) methodology to evaluate perceptions in the active management of cross-timber forest resources for Texas, Oklahoma, and Kansas. Their results identified uncontrolled fire and financial burden as the major hindrance in the sector's management. Ren et al. [28] used an enhanced multi-objective stochastic fuzzy programming technique to optimize agricultural lands and water allocation. The enhanced model was used in a case study in the Wuwei state of China. From their study, the shortage of water in the study area is severe and cannot meet the water demand of the area even if the risk probability reaches 0.25. Nikkhah et al. [29] also used the AHP to develop a weighting scheme to assess agricultural production using the Iranian tobacco production system as a case study. The combination of life cycle assessment and AHP suggests 1 for global warming, 0.790 for terrestrial eutrophication, 0.518 for acidification, 0.681 for the depletion of fossil fuels, 0.422 for phosphate resources depletion, and 0.263 for the depletion of potash resources.

Finally, a multi-criteria analysis-based cumulative sustainability index was proposed [30] to assess varying chemical process routes. This model helps in the selection of an optimal process in that regard. Haque et al. [31] combined SWOT and AHP to identify and rank SWOT factors for cross-border electricity trade for Bangladesh. Their analysis identified weaknesses and threats as the most pronounced for the trading of electricity in Bangladesh. Cucchiella et al. [32] employed the AHP methodology to rate multiple criteria such as recycled waste, greenhouse gas, and government expenditure for environmental protection, for European countries. Paul et al. [33] integrated the AHP and geospatial multi-criteria decision analysis (MCDA) to analyze the potential of reclaimed water use in California's agricultural irrigation. Their study established the need to use both knowledge-based and data-driven criteria and sub-criteria during decision making. Cay and Uyan [34] used the AHP approach to determine preferences for land consolidation and reallocation processes. According to their study, 62.7% of the people who participated were satisfied with the interview-based land reallocation model, while the AHP-based land reallocation model attracted 91.5% satisfaction.

4. Materials and Methods

The methodology adopted for this study is presented in Figure 2. SWOT-AHP was used to realize the objective of this study. In the SWOT-AHP approach, the first requirement is to obtain the factors for the SWOT analysis. It is a crucial step, and it requires a detailed assessment in order to be able to comprehend how each factor affects decision making.

4.1. SWOT Analysis

SWOT is a strategic tool that assists individuals and businesses in identifying the strengths, weaknesses, opportunities, and threats in relation to businesses and the development of projects. SWOT analysis stipulates the objectives of projects and helps detect both internal and external influences that can either favor or negatively affect the realization or development of the objectives [35,36]. It presents processes of strategic development for programs or projects. It has been extensively used to explore internal and external environments to attain systematic strategies and support approaches for decision making regarding projects and programs [37]. Although SWOT has its weaknesses, its usefulness in examining possibilities in decision making and the flexibility in combining it with other approaches such as the AHP offer novel insights that makes it relevant in the literature [38,39]. Patidar et al. [40] observed that developing strategies for program or project execution and improvement is very complex and hence requires an in-depth understanding of the

processes involved. Therefore, SWOT helps to achieve this goal given its simplicity and ease of use. Table 1 provides essential questions used as guidelines in SWOT analysis.

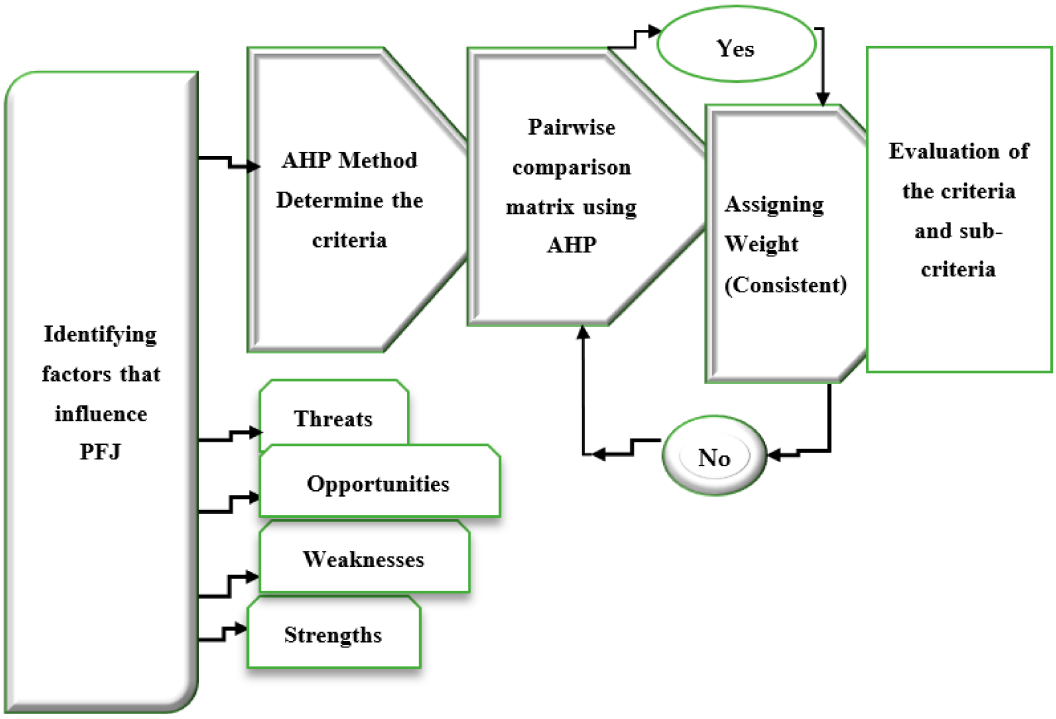

Figure 2. The methodology of the study.

Table 1. Questions for the development of the strengths, weaknesses, opportunities, and threats (SWOT) analysis matrix. Modified from [41].

Internal Strengths	**Internal Weaknesses**
What are the advantages of the program?	What are the drawbacks of the program?
What is being done well?	What can be done better?
What do others see as advantages of the program?	What is being done poorly?
External Opportunities	**External Threats**
Which factors positively influence the sustainable implantation of PFJ?	What are the future competition scenarios?
What are the likely opportunities?	What are the potential barriers?
	Will technological shift threaten the program?

The main goal of SWOT analysis is to examine the external and internal factors that stimulate or hinder the progress or successful implementation of projects or programs to support operational decisions [42]. SWOT is basically made up of four quadrants—the first two comprise the strengths and weaknesses (these make up the internal factors) and the second two consist of the opportunities and threats (these make up the external factors) [43].

SWOT analysis has been extensively employed in most recent years to evaluate the bottlenecks and potentials of projects and programs in the agricultural sector. For instance, [44] employed SWOT to formulate development strategies for Indonesia's agricultural program. Fauzi et al. [45] also used SWOT analysis to examine strategies to improve small-scale cocoa enterprises in Indonesia. Horgan et al. [46] explored rice farmers' production potentials and opportunities in Sri Lanka using SWOT analysis. Shcherbak et al. [47] employed SWOT analysis to formulate sustainable development strategies in rural areas of Ukraine.

4.2. Analytical Hierarchy Process

The AHP decision analysis tool was first developed by [48]. It is a mathematical tool used to evaluate complex decisions that involve a number of criteria [34,49]. The AHP methodology is a robust MCDM process that has been used in evaluating unstructured and complex problems in different decision-making scenarios, including, but not limited to, health, defense, energy, agriculture, education, and forest management [24,50]. It is an acceptable methodology because of its rigorous nature regarding qualitative judgments and strength of preferences [51].

To assign weights to the various criteria (i.e., the various factors considered under SWOT analysis), a pairwise comparison matrix was created. The Saaty's 9-point scale of relative importance shown in Table 2 was used in this study. Experts from academia, businesses, and policymakers were consulted to judge the various criteria identified under SWOT analysis. A pairwise comparison matrix was then derived using Equation (1) [52].

$$M = \begin{bmatrix} C_{11} & C_{12} & C_{13} & \cdots & C_{1n} \\ C_{21} & C_{22} & C_{23} & \cdots & C_{2n} \\ C_{31} & C_{32} & C_{33} & \cdots & C_{3n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ C_{n1} & C_{n2} & C_{n3} & \cdots & C_{nn} \end{bmatrix} \quad (1)$$

where $M = [c_{ij}] \ \forall \ i, \ j = 1, \ 2, \ 3, \ldots n$ is for n criteria which affect the final objective of the study, and c_{ij} signifies the relative importance of the various criteria, C_i over C_j. The reciprocal of this is C_{ji} or $1/C_{ij} \ \forall \ i \neq j$ and $C_{ii} = 1$ [53].

The weights for the criteria or factors were calculated by normalizing each eigenvector to the principle eigenvector of the reciprocal ratio matrix. The ranking values for the various criteria were then normalized to 1.

The consistency in the decision from experts is controlled by the consistency ratio (CR). The quotient of consistency and inconsistency index of the stochastic matrix for the matching vector is taken as the criterion to judge the decision's inconsistency [54]. The CR can be computed using Equation (2) [52].

$$CR = \frac{CI}{RI} \quad (2)$$

where CI represents the consistency index, and RI denotes the random index shown in Table 3, which depends on the size of the matrix [55] and can be calculated using Equation (3).

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (3)$$

where n represents the size of the matrix for the pairwise comparison, and λ_{max} denotes the principle eigenvalue.

Table 2. Scale of relative importance as reported in [56].

Intensity of the Weight	Explanation	Inference
1	Equal significant	Two criteria contribute equally to objectives
3	Moderately more significant	One criterion slightly favored over another
5	Strongly more significant	One criterion strongly favored over another
7	Very strongly more significant	One criterion favored very strongly over another
9	Enormously more significant	The evidence favoring one criterion over another is of highest possible order of affirmation
2, 4, 6, 8	Intermediate values	Employed to represent compromise between the priorities listed above
	Reciprocals	If one criterion has one of the above non-zero numbers assigned to it when compared to criteria, then it has the reciprocal value when compared with criteria

Table 3. Random index [27].

n	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

A $CR \leq 0.10$ or 10% is seen as satisfactory in terms of the degree of consistency and can therefore be used for further analysis. If $CR > 0.10$ or 10%, then there are serious inconsistencies and the AHP may not offer a meaningful result; in this case, there will be the need to repeat the process [34].

5. Results and Discussion

This section presents the results and discussion for the SWOT-AHP methodology used for the analysis. It includes a detailed analysis of each criterion, i.e., the SWOT analysis and the weights obtained from the calculations of the various priorities from the experts in the industry using the AHP. A summary of the factors considered is presented in Table 4 and a detailed analysis of each factor is presented in subsequent sections.

Table 4. SWOT analysis of Ghana's Planting for Food and Jobs program.

Internal Factors	
Strengths (S)	**Weaknesses (W)**
Favorable environmental conditions	Inadequate financial services
Availability of cheap labor	Poor production technologies and rural infrastructure
Availability of agricultural lands	Over-reliance on climatic conditions
The existence of practical indigenous knowledge on agricultural practices	Poor post-harvest management practices and market coordination
External Factors	
Opportunities (O)	**Threats (T)**
Growing need to achieve the Sustainable Development Goals (SDGs)	Negative ramification of climate change
High export potential	High importation of basic food
One District One Factory (1D1F) initiative	Insufficient political will towards the continuity of programs
Growing emphasis on the production and consumption of local food	Weak links among research, markets, and policy

5.1. Strengths

5.1.1. Favorable Environmental Conditions

The suitability of environmental conditions such as precipitation, temperatures, and soil conditions are critical for the agricultural development of a country. In Ghana, environmental conditions are categorized into five main ecological zones and defined by climate, natural vegetation, and soil types [4]. As a result of the existence of the different ecological zones, farmers can identify crops that are suitable for the conditions of a given zone. Srinivasan et al. [57] and Beck [58] reported that crop suitability could be defined as the adaption of crops to a given set of climatic and other biophysical characteristics of an area to sustain a crop production cycle. The suitability of different crops to the different ecological zones in Ghana presents farmers with a unique opportunity to adopt different on-farm climate change mitigation strategies. Given that one major distinguishing feature of Ghana's ecological zones is vegetation or land cover, the climate change effect is likely to vary. For instance, while the climate change effect may increase precipitation in some ecological zones, it may reduce precipitation in others. As such, farmers have the opportunity of selecting crops that thrive in other ecological zones under certain conditions to meet the demands of their respective ecological situations (see Table 5).

The favorability of environmental conditions, especially under the different ecological zones for certain crops, makes crop diversification in Ghana a viable option for combating low productivity in the agricultural sector due to climate change [59,60]. Amfo and Ali [61] observed that farmers might intercrop drought-resistant crops with crops that are less prone to fluctuations in climatic condition.

Table 5. Characteristics of Ghana's agro-ecological zones [62].

Zone	Area (1000 ha)	Rainfall (mm/yr)	Length of Growing Season (Days)	Dominant Land Use Systems	Main Food Crops
Rain forest	750	2200	Major season: 150–160 Minor season: 100	Forest, plantations	Cassava, plantain, maize, oil palm
Deciduous forest	740	1500	Major season: 150–160 Minor season: 90	Forest, plantations	Cocoa, cassava, plantain, maize, oil palm
Transition zone	6630	1300	180–200	Annual food and cash crops	Maize, cassava, yam, taro (cocoyam), plantain, groundnut, cowpea, maize
Guinea Savannah	14,790	1100	180–200	Annual food and cash crops, livestock	Sorghum, maize, groundnut, millet, yam, cowpea, maize
Sudan Savannah	190	1000	150–160	Annual food crops, livestock	Millet, sorghum, cowpea, groundnut, yam, maize
Coastal savannah	580	800	Major season: 100–110 Minor season: 50	Annual food crops	Cassava, maize

5.1.2. Availability of Labor

As is the case in many African countries, agriculture in Ghana is highly labor-intensive and requires an economically active population to thrive. GLSS 6 [12] reports that the country's economic active population (77.1%) indicates the country's labor potential. This population is largely made up of persons between the ages of 15 and 65 years. Given these figures, the country's high rate of unemployment presents a significant opportunity for the PFJ program in terms of labor availability. Job creation for the seemingly rising number of the country's unemployed population underscores the importance of the PFJ program which seeks to create jobs through the production of food for both local consumption and export. According to the GSS [5], the average household size in rural areas is 5 persons per household compared to the 4 persons per household in urban areas. However, recent studies have found that regional averages for household sizes are significantly higher than that of the national average. For instance, [6] observed that while the northern regional average is 7.7 persons per household, the national average is 4.4 persons. Given that most rural people are predominantly engaged in the agricultural sector, the average household size of 5 persons per household serves as a source of a strong labor potential for farm households. Amfo and Ali [61] observed that farm households in Ghana rely heavily on family labor because they are usually resource-constrained and unable to afford the services of hired labor for their farm operations.

5.1.3. Availability of Agricultural Lands

The availability of arable lands for agricultural purposes, especially at the household level, is a very critical factor considered when farmers decide to adopt agricultural farm technologies or accept agricultural initiatives. Household heads or community leaders usually own agricultural lands and hence decision-making processes regarding the use of these lands for farming purposes are free from bureaucratic processes that may hinder or delay such decisions. Over the past decade, agricultural land has expanded significantly. According to [4], agricultural lands have expanded from 13% in the 1970s to over 32% in 2016. The expansion of the country's agricultural land area presents a unique potential for scaling up agricultural production and productivity levels if efficiently managed. Given that land availability is a critical factor considered in determining productivity levels, this unique case for Ghana (Figure 3) implies that farmers are more likely to acquire agricultural land at cheaper costs and, as such, can afford to expand their production levels either by expanding their land sizes or investing in other aspects of their production.

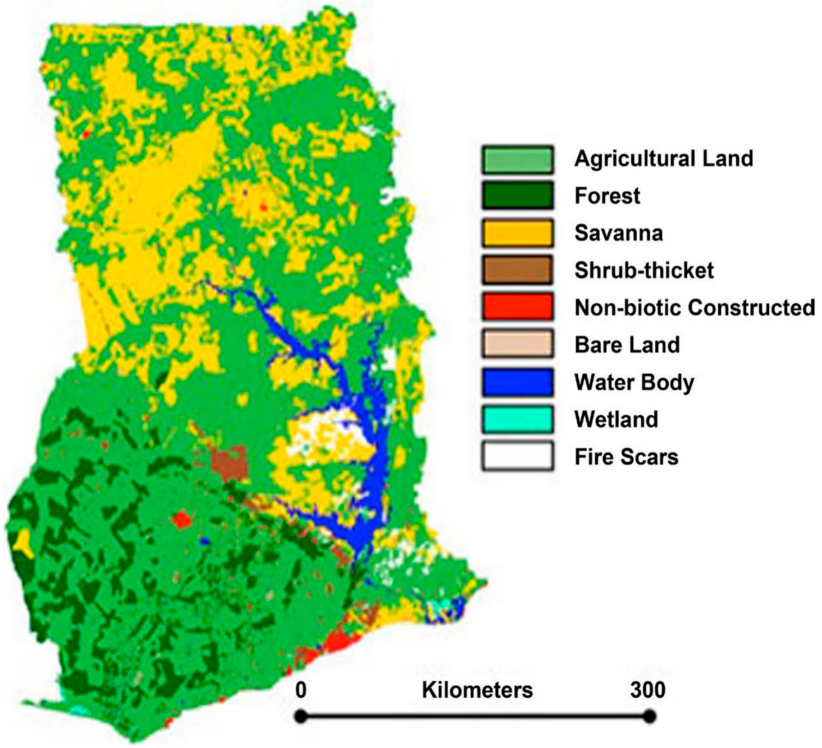

Figure 3. Map of Ghana's agricultural area [63].

5.1.4. The Existence of Practical Indigenous Knowledge on Agricultural Practices

Scientific knowledge is undoubtedly the most critical form of knowledge required to develop any sector. However, the over-reliance on scientific knowledge and the neglect of farmers' indigenous knowledge, especially in agricultural extension practice, have long been identified as a barrier to increase agricultural productivity [64], especially in developing countries. This notwithstanding, there is growing emphasis on improving the capacity of extension services (e.g., staff, facilities, logistics) in developing countries such as Ghana, while neglecting the need to actively listen and engage farmers' indigenous knowledge [65]. Most agricultural extension modules in Ghana assume that farmers have zero knowledge of their operations. As such, it is the duty of extension agents (officers) to teach farmers what to do. This approach to agricultural extension services coupled with other factors has negatively affected productivity levels in the country. This is because most improved technologies directed at enhancing farmers' efficiency and productivity were designed without consultation with the main stakeholders (farmers) and, as such, have failed to achieve the expected results.

Like any other country, Ghanaian farmers have accumulated a wealth of knowledge over the years from their farms [66]. In fact, the literature has established a positive linear relationship between farmers' experience and agricultural productivity [20,67], emphasizing the importance of complementing scientific knowledge with farmers' indigenous knowledge for a sustained development. Studies observed that Ghanaian farmers who belong to local farmer groups or farm-based organizations (FBOs) tend to be more efficient and productive in their use of agricultural resources than their counterparts who do not belong to such groups because they learn from each other and share indigenous information [20,67].

Based on the experts' pairwise rating presented in Table 6, a normalized pairwise matrix was derived, which is presented in Table 7. From the analysis, favorable environmental conditions identified as a strength recorded the highest weight, where it recorded 59.3%, followed by availability of agricultural lands which recorded 21.8%. Availability of cheap labor and practical indigenous knowledge on agricultural practices recorded 12.6% and 6.3%, respectively.

Table 6. Pairwise comparison matrix for strengths.

Criteria	S1	S2	S3	S4
S1	1.00	5.00	4.00	7.00
S2	0.20	1.00	0.33	3.00
S3	0.25	3.00	1.00	3.00
S4	0.14	0.33	0.33	1.00
Total	**1.59**	**9.33**	**5.66**	**14.00**

Table 7. Normalized pairwise matrix for strengths.

Criteria	S1	S2	S3	S4	Criteria Weight (CW)	CW, %
S1	0.629	0.536	0.707	0.500	0.593	59.3
S2	0.126	0.107	0.058	0.214	0.126	12.6
S3	0.157	0.322	0.177	0.214	0.218	21.8
S4	0.088	0.035	0.058	0.071	0.063	6.3

A CI of 0.058 was obtained, and using an RI of 0.90, a CR of 0.064 was recorded for the AHP which is less than 0.1, which is an indication that the decisions from the experts are satisfactory and can be used for decision making. The consistency matrix used to obtain the CI is represented in Table A1 in the Appendix A.

5.2. Weaknesses

5.2.1. Inadequate Financial Services

The Ghanaian economy is basically agrarian and mostly dependent on smallholder farmers struggling to elevate themselves out of the poverty bracket. Access to financing by particularly these smallholder farmers is consistently cited as the major hindrance to the country's agricultural sector growth. The donor agencies and government have, over the years, tried to increase access to funding and investment for the country's agribusiness; however, a large gap persists. Several financial institutions perceive the agricultural sector as intrinsically risky and view the small and medium-sized enterprises in the agricultural sector as a non-bankable segment [68]. The quest to provide formal credit to farmers at the small-scale level and for agricultural development in general led to the establishment of the Agricultural Development Bank (ADB) in the 1960s. The commercial banks in addition to the ADB were obliged as a matter of policy to give credit not less than 25% of their loanable capitals to activities in the agricultural sector at reduced interest rates. However, these policies were obliterated in 1990, and interest on loans for agricultural activities was increased to levels comparable to interest charged on loans for non-agricultural activities. Agricultural activities in Ghana are at a disadvantage relative to commercial interest determination because of the relatively high risk in the sector, the high rate of non-payment of loans, and the high cost of administering credit to farmers at the small-scale level [69].

5.2.2. Poor Production Technologies and Rural Infrastructure

Technological change remains a key driving force in the agricultural sector; it increases productivity and promotes the development of agriculture. Agriculture mechanization is one of the most important ways to develop the agricultural sector. A farming system dependent on traditional forms of operation cannot be sustainable. Mechanized farming is inductive to variations in the cropping pattern since it enables farmers to cultivate multiple crops which ultimately increases the cropping intensity [70]. The adoption of mechanization is an evolutionary process which depends on a specific country's agro-climatic conditions, social conditions, and economic factors for which policies of the government have an impact [71]. Agriculture is still mainly practiced in Ghana using "cutlasses and hoes", a

technology with very little irrigation and post-harvest processing. A significant number of farmers practice subsistence farming with low profits from their holdings. Ghana's agricultural production system is labor-intensive, and a significant number of farming communities have very little access to agricultural machinery, if any [72]. The Government of Ghana, against this background, introduced a concept known as the AMSEC as part of the four initiatives included in the 2007 agricultural development strategy. The initial group made up of 17 AMSECs was formed in 2007/2008, and the second batch of 52 was formed in 2009, while the remaining AMSECs were formed between 2010 and 2011. However, the initial AMSEC programs had challenges and were not successful. Five to seven tractors (with harrows, ploughs, and trailers) were given to each of the 69 AMSECs established in 2007–2009. They were only to pay 10–20% of the subsidized fee (30%) as an initial payment for a five-year zero-interest loan [73]. However, a study revealed that the interest rate on loan repayment for the AMSECs (formed in 2007/2009) was only 17.2%, whereas that of the one established in 2009 was 44.9%. The Japan International Cooperation Agency (JICA) reported that close to one third of AMSECs are yet to honor their repayment after the down payment [74].

Despite the introduction of the AMSEC, mechanization in the agricultural sector is still incoherent and inaccessible to many farmers. It is reported that 35% of the country's farmers are privileged to have some form of mechanization [75].

The nexus between rural economic development and entrepreneurship has clearly been previously reported [76,77]. Rural entrepreneurs are regarded as transformers of communities because they create jobs and link the local economies to external markets which increases farmers' incomes and wealth. However, entrepreneurship in rural areas is very complicated and multifaceted. A key area of complexity is the built capital (infrastructure), which is a factor that plays a key role in facilitating rural entrepreneurship [78,79]. It is estimated that close to 80% of Ghanaian farm harvests are transported by head-portage from farms to homes mainly by children and women, which is largely attributed to poor roads linking these farms to cities. This has led to an increase in the rate of drudgery in transporting farm produce within the country. The poor nature of roads linking farms, homes, and markets results in major economic losses. Most farmers who do not want to go through this ordeal sell off their produce at the farm gate at a very low cost [79].

When infrastructure at the rural areas is non-existent or deteriorates, the cost of marketing farm produce can be exorbitant for the poor. The construction of roads in rural areas could undoubtedly increase agricultural productivity by enabling farmers to reach new lands for cultivation or through the intensification of existing land usage [80].

5.2.3. Over-Reliance on Climatic Conditions

The majority of smallholder farmers in countries in sub-Saharan Africa and Ghana largely depend on rainfall for production. Studies show that over 60% of staple foods are cultivated using rainfall, and this is practiced by over 90% and 80% of African communities and other countries in the world, respectively [81,82]. Agricultural activities that rely on rainfall in Ghana account for a greater percentage, and this is even more prevalent in rural areas [83]. For example, the country's cocoa sector, which contributes a significant portion of the country's GDP, is virtually reliant on rainfall. Thus, rainfall has become the major source of water supply for the country's agricultural sector [82,83]. It is even more serious because most of these farmers depend on indigenous knowledge to predict the weather and climate [84,85].

5.2.4. Poor Post-Harvest Management Practices and Market Conditions

Ghana's agricultural sector struggles to provide the needed ratios of food supplies to the Ghanaian people and even embark on an aggressive export of such produce to other countries. This is mainly due to the high levels of post-harvest losses at the farm, retail, and wholesale levels. Despite the hard-working nature of Ghanaian farmers relative to the production of crops such as vegetables, crops, and tubers, it is estimated that 30% to 45% of

their produce is lost due to poor post-harvest management and handling practices. This culture in the country threatens food security, nutrition, and the incomes of farmers [86]. It is important to treat farm produce immediately after harvest [87]. This is because the perishability rate for fresh horticultural products relative to post-harvest losses is estimated to be between 30% and 50% for fruits and vegetables [88]. For this reason, post-harvest management is necessary in every country to minimize the level of losses with respect to quantity and quality, from the period of harvesting to consumption [86,89]. Due to poor post-harvest structures and infrastructure in Ghana, the country finds it difficult to meet its objective on crop storage, and therefore farmers are unable to store their products to await better prices and also to meet future food needs [90]. According to Ansah et al. [90], farmers lose an average of 9.6% of their harvested yams within a two-month period, whereas traders lose about 3.3% of their stored yams due to poor storage mechanisms in a district in Ghana.

In Ghana, lack of ready markets for the produce of smallholders is identified as one of the main challenges for the sector, and this is also because of the lack of enough processing facilities in the country [91]. One major challenge faced by farmers in developing countries in the marketing sector is weak bargaining power by smallholder farmers. This is because most of such farmers lack information on prices, alternative marketing strategies, or demand conditions. Some farmers may also default on agreements, which is a disadvantage to traders. It is reported that these contractual inadequacies decrease the performance of the market system [92]. Smallholders in Ghana are mostly not directly included in the marketing chain of their produce for export trade. Such farmers generally develop linkages with agents responsible for exports. Therefore, the gains of the smallholder farmer in Ghana depend on the market structure [93].

Access to markets especially for smallholders is critical for their development because it creates the needed demand and presents remunerative prices, which have a positive effect on the incomes of smallholders [94]. Access to better markets can also lead to an expanded production and adoption of technologies that enhance productivity [95,96].

Table 8 shows the pairwise comparison matrix used to evaluate the weights for the weaknesses in Ghana's agricultural sector. Results from the normalized pairwise comparison in Table 9 suggest that the most significant factor (weakness) hindering the progress of the agricultural sector in Ghana is the lack of/inadequate financial services, where it recorded the highest weight of 55.8%. Over-reliance on climatic conditions (i.e., rain-fed agricultural practices) followed with a weight of 25.9%. Poor production technologies and rural infrastructure and poor post-harvest management practices followed with weights of 11.2% and 7.10%, respectively.

Table 8. Pairwise comparison matrix for weaknesses.

Criteria	W1	W2	W3	W4
W1	1.00	5.00	3.00	6.00
W2	0.20	1.00	0.33	2.00
W3	0.33	3.00	1.00	4.00
W4	0.17	0.50	0.25	1.00
Total	**1.70**	**9.50**	**4.58**	**13.00**

A CI and CR of 0.027 and 0.030 were obtained, respectively. The results indicate that the adopted matrix has a consistency that is acceptable and can be adopted for further studies. The calculations for the consistency check are presented in Table A2 in the Appendix A.

Table 9. Normalized pairwise matrix for weaknesses.

Criteria	W1	W2	W3	W4	CW	CW, %
W1	0.588	0.526	0.655	0.462	0.558	55.8
W2	0.118	0.105	0.072	0.154	0.112	11.2
W3	0.194	0.316	0.218	0.308	0.259	25.9
W4	0.100	0.053	0.055	0.077	0.071	7.10
Total	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**100**

5.3. Opportunities

5.3.1. Growing Need to Achieve the Sustainable Development Goals (SDGs)

Hunger is on the rise globally; it affects about 821 million of the world's population [97]. As a result, the second SDG (i.e., SDG 2) builds on the advancement attained under earlier hunger extermination efforts and presents an ambitious target to end hunger worldwide by 2030 [98]. The principal targets of SDG 2 include [99]: ending of all forms of malnutrition by the year 2030; guaranteeing sustainable food production systems as well as implementing robust agricultural practices by 2030; doubling production and proceeds of smallholder farmers by 2030; and, finally, sustaining genetic diversity of plants, seeds, and animals. These targets are intended to be implemented through the following: the adoption of measures to safeguard the effective functioning of food commodity markets and the facilitation of timely access to market information; correction and prevention of trade restrictions and distortions in agricultural markets globally; and an increase in investments through improved transnational cooperation [99]. Ghana has therefore put several policies in place to support the agricultural sector, and these include PFJs, RFJs, Planting for Export and Rural Development, Greenhouse Villages, and AMSEC. These policies are intended to help address the declining growth in Ghana's agricultural sector [100]. These policy incentives will open up the country's agricultural sector for investment.

5.3.2. High Export Potential

Ghana's trade policy offers clear and transparent procedures for implementing the government's international and domestic trade agenda. The Government of Ghana provided an enabling environment for trade in the private sector which aided the country's economic growth. The policy is to be realized through the complete spectrum of trade policy instruments across these objectives: increasing production volume for local and export markets; creation of a fair and transparent regime for import and export; protection of the consumer and fair trade; facilitating trade; and multilateral trade and the protection of intellectual property rights [101].

Ghana's export sector has seen significant progress over the years, and some of the significant interventions in the sector are as follows [101]:

- National Export Strategy (NES)—one of the objectives of the NES includes the development of the potential of the non-traditional export sector to increase its contribution to the country's GDP as well as the overall development of the country.
- African Growth Opportunity Act (AGOA)—this is the United States government trade initiative, which is enacted in some 39 sub-Saharan African countries. The initiative has more than 7000 products under it with a generalized system of a preferences list which can enter the US under duty free. The AGOA initiative has encouraged the export of processed agricultural products, apparel, footwear, etc., to the US from qualifying countries.
- ECOWAS Common External Tariffs (CET)—Ghana has, since 2004, supported the adoption of CET. This is because it is seen as one of the key conditions required for the formation of a customs union and the deepening of the sub-region's integration agenda. The entire members of ECOWAS agreed to adopt and implement the CET rate. However, the implementation of this policy has been haphazard with a

number of barriers along the borders as a result of lack of commitment from some member countries.

Furthermore, the introduction of the African Continental Free Trade Area (AfCFTA), which seeks to consolidate the entire continent into a single trade area, presents a great opportunity to trading enterprises, consumers, and businesses on the African continent. AfCFTA is expected to cover a market share of about 1.2 billion people and a GDP of approximately USD 2.5 trillion for all 55 countries within the African Union. This makes AfCFTA the largest free trade area in the world since the creation of the World Trade Organization [102]. The Ghanaian farmer will therefore have a larger market for their products both local and international.

5.3.3. One District One Factory (1D1F) Initiative

The 1D1F program as an initiative is a critical component of the Government of Ghana's industrial transformation agenda. It aims at establishing local manufacturing facilities through small and medium-sized enterprises. The program can open up the local economics, create job opportunities, increase export earnings from refined raw materials, and reduce reliance on imports [103]. The program's successful implementation will come with numerous opportunities for the Ghanaian farmer since it will create a ready market for their produce at the district level. It is, therefore, suggested that the period where most farm produce will be left to rot due to lack of storage capacities or processing will be a thing of the past.

5.3.4. Growing Emphasis on the Production and Consumption of Local Food

In the recent past, there have been calls by experts, academicians, and policymakers on the need to scale up the production and consumption of local foods. These calls are against the backdrop that the Government of Ghana spends millions of dollars on food imports such as rice and poultry meat. Given that Ghana's government is implementing policies to modernize the agriculture sector, it is important to complement these efforts with policies that encourage the consumption of indigenous foods. Policies that encourage the consumption of local foods tend to create ready markets for local farmers. Hingley et al. [104] observed that renewing consumers' interest in what they eat helps to create a multiplier effect that benefits local production and retailers of local foods. Further, the consumption of local/indigenous foods has been found to have environmental, economic, and social benefits. For instance, [105] outlined the following:

- Environmental benefits through more sustainable production systems and reduced transport externalities;
- Economic benefits through high incomes for farmers and more financial contributions to local economies;
- Social benefits through greater trust and connectedness between and within consumers and producer groups.

The pairwise comparison matrix for the opportunities is presented in Table 10. Results for the normalization and weights for the various criteria for the opportunities are presented in Table 11. It can be seen from the results that the high export potential relative to agricultural products in the country was identified as the highest opportunity, where it recorded a weight of 50.3%. The 1D1F initiative also came up as the second highest opportunity in Ghana's agricultural sector since it provides ready markets for smallholder farmers at the district level. The growing need to achieve SDG 2 and the campaign emphasizing the need to increase production and consumption of local products recorded 11.1% and 5.7%, respectively.

Table 10. Pairwise comparison matrix for opportunities.

Criteria	O1	O2	O3	O6
O1	1.00	0.20	0.20	3.00
O2	5.00	1.00	2.00	7.00
O3	5.00	0.50	1.00	5.00
O4	0.33	0.14	0.20	1.00
Total	**11.33**	**1.84**	**3.40**	**16.00**

Table 11. Normalized pairwise matrix for opportunities.

Criteria	O1	O2	O3	O4	CW	CW, %
O1	0.088	0.109	0.059	0.188	0.111	11.1
O2	0.441	0.543	0.588	0.438	0.503	50.3
O3	0.441	0.272	0.294	0.313	0.330	33.0
O4	0.029	0.076	0.059	0.063	0.057	5.7
Total	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**100**

The AHP for the opportunities recorded a CI and CR of 0.049 and 0.055, respectively. The computations for the consistency check for the opportunities is presented in Table A3 at the Appendix section.

5.4. Threats

5.4.1. Negative Ramification of Climate Change

The negative ramification of climate change and its economic impact on developing countries such as Ghana have attracted much concern from stakeholders [106]. Climate change impact on agricultural production in Ghana over the past years has worsened [60,65]. Fluctuations in climate variables such as rainfall and high temperatures have led to a reduction in Ghana's productivity levels. While warm and dry weather conditions negatively affect soil moisture and nutrients [107], excessive rainfall may cause floods, thus affecting output. In this regard, the effect of climate change may occur in two ways. First, excessive rainfall may create favorable conditions for the growth and multiplication of pathogens, especially among perennial crops such as cocoa and coffee [108]. Second, a decrease in rainfall may cause a reduction in soil water content, thereby resulting in drought which may deprive plants of the ability to synthesis soil nutrients for proper growth and development [108]. Moreover, delays in the onset of rain affect farmers' preparedness for the season and affect productivity [109].

This notwithstanding, studies have found that climate change affects crops differently depending on the crop's physiology [109–111]. The growing incidence of droughts, late or early rains, floods, decreasing annual precipitation, and increasing temperatures especially in Ghana has severely exposed farmers' vulnerabilities due to the over-reliance of the sector on climate factors. Therefore, it is imperative for farmers to adopt climate change mitigation strategies and technologies since future changes in the climate will occur even if full-scale mitigation efforts were to be successfully implemented. Additionally, an integrated approach is required to assess the impacts of climate change on multiple crops to provide a comprehensive adaptation strategy.

5.4.2. High Importation of Basic Food

Despite its massive agricultural potential, Ghana has remained a net importer of agricultural products in recent years. Over the last decade, the value of agricultural imports has increased. For instance, in 2018 alone, Ghana's total import value of agricultural products was USD 2.52 billion (https://www.statista.com/statistics/1111144/import-of-

agricultural-products-to-ghana/ (Accessed on 20 July 2020)). Darfour and Rosentrater [112] noted that Ghana imports about 70% and 15% rice and maize, respectively, of its total consumption. Although this has helped, to a very large extent, to reduce the country's food insecurity status, it has affected local production of such crops. Like any other sector, Ghanaian farmers cannot compete with imported goods which tend to present consumers with competitive prices. The most likely explanation for this could probably be attributed to the high cost of agricultural production in the country compared to the production cost of foreign goods. Bunn et al. [113] and Asamoah and Owusu-Ansah [114] observed that Ghana's agricultural sector is estimated to have created about 800,000 jobs for rural households in the country. These farmers mostly rely on traditional tools and methods as well as depending heavily on stable climatic indicators. Other factors such as the lack of adequate market incentives, limited access to production technologies, poor road network especially in farming communities, poor post-harvest management techniques and technologies, and high cost of production inputs [36] all contribute to the less competitive nature of locally produced agricultural goods against the imported ones. To encourage local production, the government must develop policies that seek to reduce imports and encourage local production by aiding farmers based on the aforementioned factors.

5.4.3. Insufficient Political Will Towards the Continuity of Programs

Ensuring the longevity of programs to reap the long-term benefits requires the commitment of politicians and policymakers of successive governments. Like many African countries, one major challenge hindering Ghana's economic progress is the discontinuity of programs and policies especially by successive governments. This has resulted in the abandonment of several projects in the country [35,115].

5.4.4. Weak Links between Research, Markets, and Policy

Establishing a strong link between research, markets, and policies is significant to developing any production sector. Thus, the sustainable development of the Ghanaian agricultural sector, to a considerable extent, is dependent on linking agricultural research to market studies to inform better policy formation. The development of the agricultural sector and the attainment of the country's food security status depends on farmers' access to a reliable market [116]. Due to the gap between research, markets, and policy, farmers face several challenges such as the over-exploitation by middlemen, poor road networks, and others [96]. To address these challenges, agricultural market research centers must be stablished at strategic locations across the country. This will help improve the quality of research between agricultural products and the market which will, in turn, inform the formulation of effective agricultural policies. Further, farmers will have adequate market information on specific products.

Despite the poor or weak links among research, market, and policy, the importance of agricultural research and development (R&D) cannot be overemphasized. Asare and Essegbey [117] reported that between 2000 and 2011, public agricultural R&D expenditure increased from USD 42.5 million to USD 67.7 million. The authors [117] observed that the increase in agriculture R&D operational and research activities was minimal as a huge portion of the expenditure went into the payment of salaries and wages rather than the development of improved agricultural technologies such as improved seed varieties and other technologies which could help curtail the impact climate change. Another major challenge of agricultural R&D, as observed by [118], is in regard to the fact that, although the Crop Research Institute (CRI), the Savannah Accelerated Research Institute (SARI), and the Oil Palm Research Institute (OPRI) produce a wide range of plant genetic materials, especially for food crops with high value for food security, and resistance to climate change effects, the technologies produced either do not meet the criteria for being patented or are not registered because Ghana is yet to pass regulations governing plant breeders' rights.

Table 12 shows the pairwise comparison matrix for the threats. The computations show that adverse ramification of climate change is the main threat to the development of

Ghana's agricultural sector, where it recorded a weight of 57.9%. This is mainly because of the country's dependence on rain-fed agricultural production. Importation of basic food products into the country recorded the second highest weight of 25%, meaning importing food products into the country can collapse the country's agricultural sector. Lack of political will on the part of the government to initiate and see to the implementation of policies in the agricultural sector took the third position with a weight of 10.8%. Weak coordination among research institutions came fourth in the ranking with a weight of 6.3%. Results for the normalization and weights for the various criteria for the threats are presented in Table 13.

Table 12. Pairwise comparison matrix for threats.

Criteria	T1	T2	T3	T4
T1	1.00	3.00	5.00	8.00
T2	0.33	1.00	3.00	4.00
T3	0.20	0.33	1.00	2.00
T4	0.13	0.25	0.50	1.00
Total	**1.66**	**4.58**	**9.50**	**15.00**

Table 13. Normalized pairwise matrix for threats.

Criteria	T1	T2	T3	T4	CW	CW, %
T1	0.602	0.655	0.526	0.533	0.579	57.9
T2	0.199	0.218	0.316	0.267	0.250	25.0
T3	0.120	0.072	0.105	0.133	0.108	10.8
T4	0.078	0.055	0.053	0.067	0.063	6.3
Total	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**100**

The results for the consistency shown in Table A4 (see Appendix A) show that the AHP for the threats is acceptable, where a CI and CR of 0.045 and 0.050 were obtained.

6. Conclusions and Policy Recommendations

Ghana's economy is predominantly agrarian, with almost half of the population engaged across all aspects of the agricultural value chain (i.e., from the producer to the consumer). With the increasing trend of the Ghanaian population, it is projected that pressures on agricultural lands and food production will increase drastically in the near future. It is crucial to take a critical look at our national agenda on agriculture, particularly the Planting for Food and Jobs (PFJs) initiative which seeks to modernize Ghana's agricultural sector.

The results obtained from the analysis in this paper provide authorities with the most critical issues to consider during policy formulation for the sector. They also give investors and other stakeholders interested in the country's agricultural sector a holistic idea about the terrain in which they seek to invest in or support and the areas that need special attention.

The following recommendations are proposed to policy- and decision-makers in the country to help in the development of the sector:

- Finance: redirect the focus of the Agriculture Development Bank to its core mandate of giving soft loans to smallholder farmers to help boost agricultural production at the local level;
- Spare parts production: It will be very important to set up companies that are into the production of agricultural equipment and spare parts. This will reduce the cost of importing such equipment into the country and also make them easily accessible to the farmer when needed;

- Digitization of extension services: This will promote the rapid dissemination of information from the officers on the field to research centers and government institutions responsible for the agricultural sector, and it will be necessary to digitize that space. The digitization of extension services will also help to connect the farmer to banks, the private sector, and NGO's for assistance when needed;
- Documentation: It is essential to provide reliable data on the country's agricultural sector. This should be taken into consideration to create a single data base station for the whole country (including data on farmers). Interested parties will access this information to support their decision making. This will reduce the sector's risks, thereby giving banks and other financial institutions the assurance that their monies given to farmers will be returned.

7. Limitations and Future Research Directions

This study was comprehensively conducted; however, some limitations need to be addressed in future study. To arrive at the factors under each of the quadrants of SWOT analysis and their weightings, we only interviewed 10 experts in the field for their feedback. Thus, it is imperative to widen the scope and increase the number of experts to achieve a much broader perspective on the subject.

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Appendix A

Table A1. Calculation of the consistency for strengths.

Criteria	S1	S2	S3	S4	Weighted Sum Value (WSV)	CW	Ratio (WSV/CW)
S1	0.593	0.630	0.872	0.441	2.536	0.593	4.277
S2	0.119	0.126	0.072	0.189	0.506	0.126	4.016
S3	0.148	0.378	0.218	0.189	0.933	0.218	4.280
S4	0.083	0.042	0.072	0.063	0.260	0.063	4.127
							4.175

Table A2. Calculation of the consistency for weaknesses.

Criteria	W1	W2	W3	W4	WSV	CW	WSV/CW
W1	0.558	0.561	0.777	0.426	2.322	0.558	4.163
W2	0.112	0.112	0.085	0.142	0.451	0.112	4.022
W3	0.184	0.337	0.259	0.284	1.064	0.259	4.108
W4	0.095	0.056	0.065	0.071	0.287	0.071	4.036
							4.082

Table A3. Calculation of the consistency for opportunities.

Criteria	O1	O2	O3	O4	WSV	CW	WSV/CW
O1	0.111	0.101	0.066	0.170	0.447	0.111	4.036
O2	0.554	0.503	0.660	0.396	2.113	0.503	4.204
O3	0.554	0.251	0.330	0.283	1.419	0.330	4.300
O4	0.037	0.070	0.066	0.057	0.230	0.057	4.053
							4.148

Table A4. Calculation of the consistency for threats.

Criteria	T1	T2	T3	T4	WSV	CW	WSV/CW
T1	0.579	0.750	0.539	0.504	2.372	0.546	4.343
T2	0.191	0.250	0.323	0.252	1.017	0.240	4.244
T3	0.116	0.082	0.108	0.126	0.432	0.070	6.182
T4	0.075	0.062	0.054	0.063	0.255	0.144	1.764
							4.134

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